An examination of the hypothesis that left-handers die earlier: The Canadian Study of Health and Aging

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The present paper is a prospective examination, using data from the Canadian Study of Health and Aging (CSHA-1 and CSHA-2), of the hypothesis that self-reported left-handers die earlier than right-handers. Persons over age 65 receiving a clinical evaluation in 1991 (n = 2786) as part of CSHA-1 were recontacted in 1995–6. At baseline, the sample showed a trend for the expected cross-generational decline in nonright-handedness with increasing age (3.2% of those aged 65–74 reported being left-handers while 2.1% were left-handers in the 85+ age group). At follow-up, there were no significant differences in mortality between self-reported right-handers (52.6% died), left-handers (56.8%), and ambidexters (46.6%). The Odds Ratio was 1.18 (95% confidence interval 0.72–1.93) for left- compared to right-handers. There was no evidence that being left-handed increased the risk of death in this sample of elderly Canadians.

**INTRODUCTION**

The notion that left-handers die earlier than right-handers originated from observed generational differences in hand preference. Cross-generational data demonstrate a decline in the number of left-handers with age (Coren & Halpern, 2001).
Substantial declines with age in the proportion of left-handers are common in cross-generational data. For instance, Bryden, Bulman-Fleming, and MacDonald (1996) reported proportions of left-handers at 1.9% (age 64+ years), 8.6% (age 35–54 years), and 19.8% (age 20–29 years) in a sample of three generations from the same families.

The decline in left-handers with age has been attributed to increased mortality among left-handers by some investigators (Halpern & Coren, 1988). Halpern and Coren (1988) reported archival data from professional baseball players showing that left-handers were, on average, eight months younger in age at death than right-handers. These investigators noted identical mortality up to age 33 but thereafter, about 2% more right-handers survived for each year of age.

The hypothesis that increased mortality in left-handers accounted for generational differences sparked much debate. Subsequent investigations produced mixed outcomes regarding the theory of increased mortality in left-handers. The literature also raised the possibility of a specific risk of accidental death in left-handers. Persson and Allebeck (1994) reported on death rates for right- and left-handers (based on shooting stance) who had been conscripted into the Swedish military. A retrospective evaluation, 19 to 20 years after the date of conscription, found no difference in relative risk (Odds Ratio 1.0) for death due to any cause for left-handers compared to right-handers. In that study, left-handers had a modestly increased risk of dying in motor vehicle accidents (Odds Ratio 1.3). Cricketers (handedness based on bowling hand) have also been the subject of investigation, with Aggleton and colleagues first reporting increased mortality (Aggleton, Kentridge, & Neave, 1993). Later, this group found no general increase in mortality but an increased likelihood of death from “unnatural causes” (Aggleton, Bland, Kentridge, & Neave, 1994). These studies are limited by their retrospective, archival nature.

Several prospective studies have collected data on mortality. Data from the IOWA Women’s Health Study found no increase (Odds Ratio 1.10) in five-year mortality for left-handers (women aged 55–69 years; Cerhan, Folsom, Potter, & Prineas, 1994). Similarly, Salive, Guralnik, and Glynn (1993) in their six-year cohort study of older adults in East Boston found no association between handedness and mortality (Odds Ratio 1.04). Ellis et al. (1998) reported the mortality status of 6097 subjects (aged 15–70 years) nine years after handedness was determined by the Edinburgh Inventory. Of the 387 who died, differences in the proportions of deaths according to handedness were not significant.

A competing explanation for the decline in left-handedness with age is that the finding represents a reduction in the social pressure against left-handedness (cf. Hugdahl, Satz, Mitrushina, & Miller, 1993). Hugdahl and colleagues reported an increase in the rate of people switching writing hand with age, providing partial support for a reduction in the pressure against left-handedness. They found that 2.69% of younger subjects (21–30 years old) and 6.75% of older subjects (80 years or above) switched. These investigators noted that
switching did not account for all of the cross-generation effect. Approximately 5% of the difference in the numbers of left-handers in the older and younger groups could not be accounted for by switching hand preference for writing.

The present paper examines the mortality experience of elderly Canadians who took part in the first phase of the CSHA. The CSHA-1 (The CSHA Working Group, 1994) was a national population-based, multi-centre study of dementia and other health problems in Canadians aged 65 and older. In 1991, the study screened 10,263 randomly selected elderly living in the community and institutions across Canada. From that initial screening 2914 persons were selected for further clinical evaluation of their health and cognitive status. Participants were re-evaluated five years (CSHA-2) after the initial assessment.

METHOD

Participants

The present study examined elderly Canadians (n = 2786) participating in CSHA-1 who received clinical evaluations and for whom there was handedness information. There were 1006 men (aged 79.3 ± 7.4) and 1780 women (aged 81.8 ± 7.4). The subjects had on average 8.6 ± 4.0 years of education.

Procedure

The CSHA-1 had a screening phase followed by a clinical evaluation. Persons received the clinical evaluation if they screened positive for cognitive dysfunction, lived in an institution, or were included as normal controls. The collection of hand preference data took place during the clinical evaluation.

Handedness was determined by self-report in 1991 as part of an assessment done by a study nurse. Subjects were asked whether they were right-handed, left-handed, or ambidextrous. In 1996, five years (range 4.1 to 5.8 years) later, the project recontacted all subjects. For those who had died since CSHA-1, research personnel contacted the Registrar General in each province to obtain the date and cause of death from death certificates. Interested readers should see Østbye, Hill, and Steehuis (1999a) and Østbye et al. (1999b) for information about other risk factors and predictors of death in the CSHA subjects.

CSHA-1 and CSHA-2 had ethics board approval in all 18 participating centres. SAS version 6.12 was used for data analyses, except for the power calculations which were done with Epi Info version 5.01.

RESULTS

The proportions of subjects in each handedness category at CSHA-1 are shown in Table 1. The data are presented according to age group. There was a trend for decreasing proportions of left-handers and ambidexters with advancing age,
\( \chi^2 (4, N = 2786) = 8.48, p = .08 \). This finding reached significance when right-handers were compared to nonright-handers, \( \chi^2 (4, N = 2786) = 8.57, p = .01 \), illustrating the expected generational differences in handedness.

Around half the subjects (52.3%) died between the initial assessment and the follow-up. The percentage of right-handers dying was 52.6%, compared to 56.8% for left-handers, and 46.6% for ambidexters. Overall, however, there was no significant effect of hand preference by mortality status, \( \chi^2 (2, N = 2750) = 1.36, p = .51 \). Table 2 shows the distribution of hand preferences in the subjects at CSHA-1 and at CSHA-2. The distributions do not differ. The Odds Ratio for mortality of left-handers compared to that of right-handers was 1.18 [95% confidence interval 0.72–1.93; \( \chi^2 (1, N = 2786) = 0.49, p = .48 \)]. The ratio for ambidexters and right-handers was .78 [95% confidence interval 0.45–1.36; \( \chi^2 (1, N = 2759) = 0.84, p = .36 \)]. For males, \( \chi^2 (2, N = 988) = 0.68, p = .71 \), and females, \( \chi^2 (2, N = 1745) = 0.91, p = .63 \), there were no differences in mortality in the various handedness groups.

Although the proportion of subjects dying in the five-year study period was not increased, left-handers still could have been younger when they died. In order to examine this possibility, the age of subjects was examined at baseline and follow-up. Table 3 shows the average age of each handedness group at both times. At CSHA-1, there were differences in age between the handedness groups, \( F(2, 2785) = 4.79, p = .008 \). Post hoc testing (Duncan’s multiple range)

### Table 1

<table>
<thead>
<tr>
<th>Hand Preference</th>
<th>All subjects (n = 2786)</th>
<th>65–74 (n = 529)</th>
<th>75–84 (n = 1290)</th>
<th>85+ (n = 967)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>95.2</td>
<td>94.0</td>
<td>94.5</td>
<td>96.7</td>
</tr>
<tr>
<td>Left</td>
<td>2.7</td>
<td>3.2</td>
<td>3.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Ambidextrous</td>
<td>2.1</td>
<td>2.8</td>
<td>2.6</td>
<td>1.2</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Handedness</th>
<th>CSHA-1</th>
<th>Living</th>
<th>Deceased</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>2651 (95.2%)</td>
<td>1232 (95.1%)</td>
<td>1369 (95.2%)</td>
<td>50 (1.9%)</td>
</tr>
<tr>
<td>Left</td>
<td>75 (2.7%)</td>
<td>32 (2.5%)</td>
<td>42 (2.9%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Ambidextrous</td>
<td>60 (2.1%)</td>
<td>31 (2.4%)</td>
<td>27 (1.9%)</td>
<td>2 (3.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>2786 (100%)</td>
<td>1295 (100%)</td>
<td>1438 (100%)</td>
<td>53 (1.8%)</td>
</tr>
</tbody>
</table>
showed that left-handers and right-handers did not differ in age. The ambidexters were younger than the right-handers but did not differ in age from the left-handers. At follow-up, age differences persisted in the living, $F(2, 1294) = 3.59, p = .03$, and dead, $F(2, 1400) = 3.19, p = .04$, subjects. For those still living, left-handers were younger than the other two groups. In those who died, right- and left-handers did not differ in age but the ambidexters were younger than the other two groups. Controlling for initial age did not result in differences in mortality by hand preference, $\chi^2 (1, N = 2723) = 0.13, p = .72$.

**DISCUSSION**

The proportion of left-handers in the CSHA sample was similar to that reported by others for elderly persons. Approximately 2% of the present sample of persons over age 65 was left-handed. This is consistent with the 1.9% reported by Bryden and colleagues (1996) and the 1.67% by Hugdahl (Hugdahl et al., 1993) for older persons. Within the present sample of elderly Canadians, decreased nonright-handedness was associated with advancing age. Thus, even in this sample limited to persons over age 65, there was a suggestion of the typical cross-generation declines in left-handedness reported in other samples.

A large number of deaths occurred over the five-year study period. More than 50% of the sample died. Even though left-handers represented a small proportion of the entire sample, the high rate of death, in this prospective data, should allow differences in mortality rates to emerge. The relative proportion of left-handers in the sample remained stable. A significantly greater proportion of left-handers did not die.

In addition, there was no significant difference in the age of death of right- and left-handers. The group of self-identified ambidexters died at a younger age than both the right- and left-handers. As their rate of death did not differ, this is likely an artifact of their being younger at the beginning of the study, pointing to the importance of considering age differences in the samples of living and dead persons as well as the rate of death.
There was no support for the hypothesis that left-handers die earlier than right-handers. The strengths of the current sample were its prospective nature and the comparatively large number of deaths. Its weakness was that even with more than 1400 persons dying in the five-year follow-up period, the power to detect a difference at an alpha of .05 was 10%. The other published reports in this area have similar power problems, pointing to the need for very large sample sizes to address this question. Another possible concern about the current sample is that they were elderly people for whom pressure to be right-handed may have biased the outcome—with the left-handers dying earlier being the ones switched to right-handedness as children, hence the lack of difference in mortality. These switched left-handers should have little impact on the proportions of right-handers dying, as they make up such a small percentage of that group. Coren and Halpern (1991) estimated 3.6% of elderly right-handers were switched from left-handedness. However, to account for the present findings (no significant difference between percentages of right- and left-handers dying) non-switched left-handers would need to be less likely to die than their switched counterparts. It does not seem likely that successful changes in handedness occurred mostly in those who would later die earlier.

Perhaps, the ultimate answer about early death for left-handers will come from population-based life-span projects in which “unbiased” handedness has been measured. Although it is not possible to remove all the environmental influences (e.g., conventions and tools favouring right hand use) affecting hand preference in left-handers, parental and educational interference appears to have been reduced in recent decades. Unfortunately, it will take many years to obtain sufficient mortality data in this group of left-handers. Meanwhile, the smaller samples, such as this one, will continue to provide clues about the relationship between handedness and mortality, and collectively (perhaps using meta-analysis) provide an answer.

The present study does not address the mechanism by which left-handedness is reduced in older persons nor does it elucidate the mortality experiences of younger left-handers. Nevertheless, left-handedness tended to decrease with age even in this sample containing only elderly persons. This suggests that if social acceptance of left-handedness accounts for the increase in younger persons, some easing of the pressure began during the early part of the twentieth century.

Manuscript received 21 May 1999
Revised manuscript received 19 November 1999

REFERENCES

